Aug. 21, 1945. C. M. OSTERHELD 2,383,414

SNAP-ACTING SWITCH

Filed Nov. 27, 1944 2 Sheets-Sheet 1

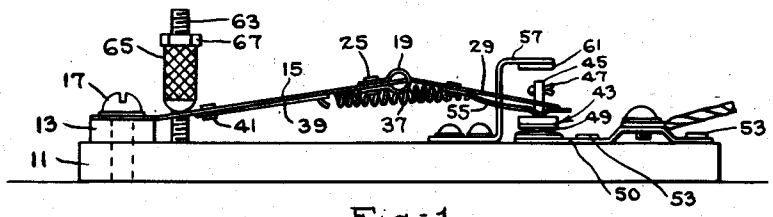


Fig-1

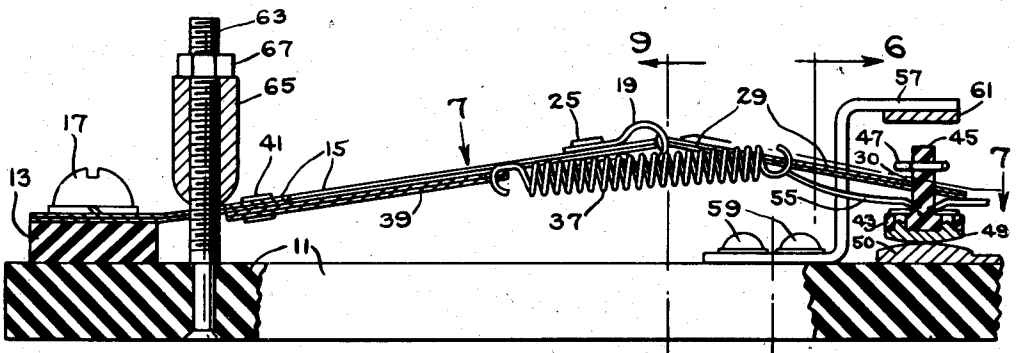


Fig-2

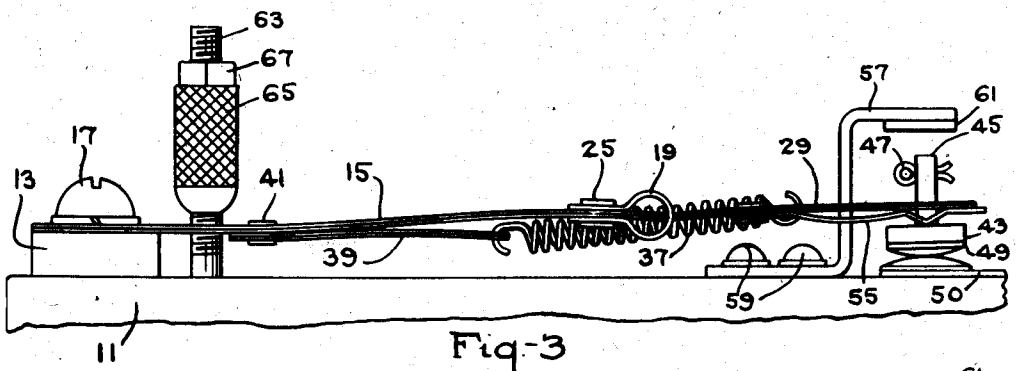


Fig-3

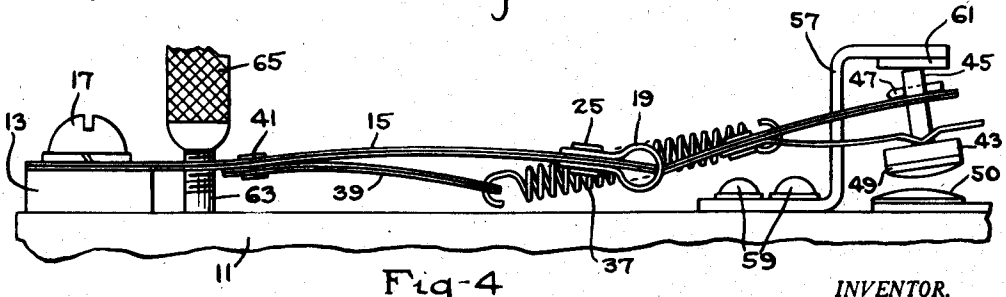


Fig-4

INVENTOR.
Clark.M.Osterheld.

BY

H M Bigbee

ATTORNEY.

Aug. 21, 1945. C. M. OSTERHELD 2,383,414

SNAP-ACTING SWITCH

Filed Nov. 27, 1944 2 Sheets-Sheet 2

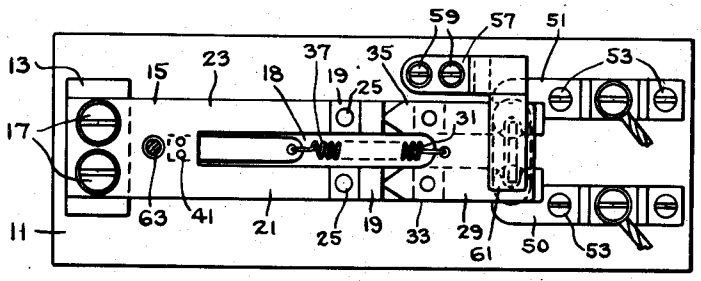


Fig.-5

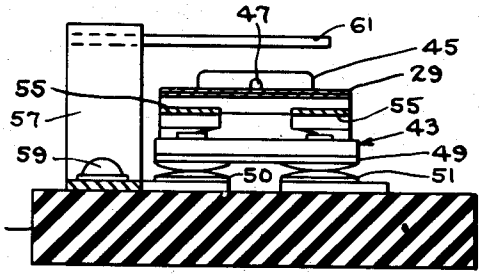


Fig.-6

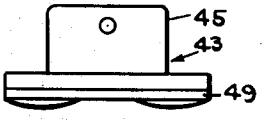


Fig.-10

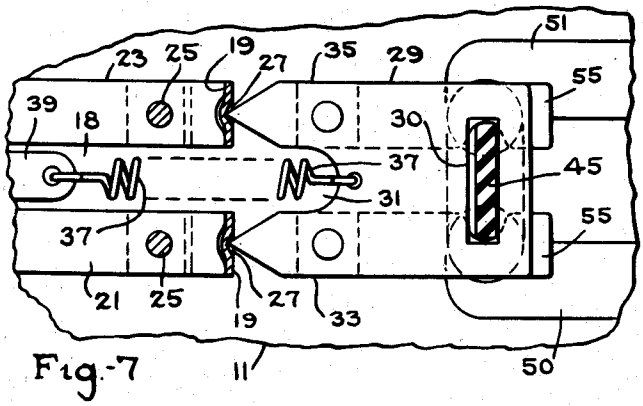


Fig.-7

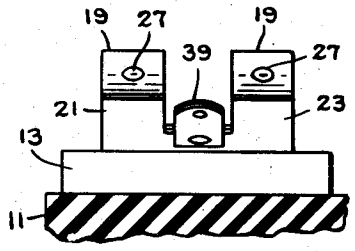


Fig.-9

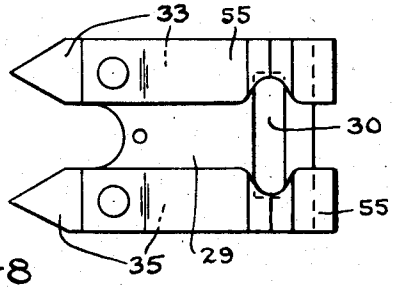


Fig.-8

INVENTOR.
Clark M. Osterheld.
BY
W. M. Biehl
ATTORNEY.

Patented Aug. 21, 1945 2,383,414

UNITED STATES PATENT OFFICE

2,383,414

SNAP-ACTING SWITCH

Clark M. Osterheld, Stoughton, Wis., assignor to McGraw Electric Company, Elgin, Ill., a corporation of Delaware

Application November 27, 1944, Serial No. 565,281

7 Claims. (Cl. 200—138)

My invention relates to switches, and particularly to snap-acting switches.

An object of my invention is to provide means in a snap-acting switch that shall increase the cooperating contact pressure between the two contacts just before disengagement thereof.

Another object of my invention is to provide a snap-acting toggle switch that shall embody means for reducing the temperature differential of operation thereof.

Other objects of my invention will either be evident from a description of one form of device embodying my invention or will be set forth in the course of such description and particularly in the appended claims.

In the drawings,

Figure 1 is a side, elevational view of the toggle switch in full size, shown when in closed position,

Fig. 2 is a longitudinal, central, sectional view of the toggle switch, shown in double size,

Fig. 3 is a side, elevational view of the toggle switch, showing the bimetals when heated and just before disengagement of the two contact members,

Fig. 4 is a side, elevational view of the switch, showing the positions of the various parts thereof with the switch in open position,

Fig. 5 is a top plan view of Fig. 1,

Fig. 6 is a sectional view, taken on the line 6—6 of Fig. 2,

Fig. 7 is a horizontal, sectional view, taken on the line 7—7 of Fig. 2,

Fig. 8 is a bottom view of the short bimetal bar and the spring arm which engages the connecting piece, as shown in Fig. 10,

Fig. 9 is an end view of the long bimetal bar, the view being taken on the line 9—9 of Fig. 2, and,

Fig. 10 is an end view of the contact bridging member.

The device embodying my invention comprises a base member 11, which may be made of electric-insulating material and which may be of substantially rectangular shape. I provide thereon a block 13 of electric-insulating material, having secured thereagainst one end of a first bimetal bar 15 as by means of a plurality of short machine screws 17, which are effective to secure not only the member 13 against the upper surface of base 11, but also to secure one end of bimetal bar 15 in proper operative position against the outer surface of block 13. The bimetal bar 15 has an elongated recess 18 therein extending from the free end thereof for a purpose which will hereinafter appear. I provide further a pair of pivot plates 19 secured to the ends of the respective side portions 21 and 23 of the bimetal bar 15. These pivot plates 19 comprise a return bent member having an arcuate intermediate portion, together with two flat end portions which are secured in any suitable or desired manner, as, for instance, by rivets 25, against the end portions of the sides 21 and 23 of the bimetal bar 15. It is shown in Fig. 7 of the drawings that the arcuate portions of the pivot plates 19 have indentations 27 therein for a purpose which will hereinafter appear.

I provide further a second bimetal arm 29, which, as will be seen by reference to Fig. 5 of the drawings, is provided also with a longitudinal, central slot 31 therein adjacent its pivoted end, providing two side portions 33 and 35, each of which has a sharp, pointed end adapted to fit into the indentations 27 in the members 19 on side portions 21 and 23.

I provide further an over center spring 37 positioned within the slots 18 and 31, one end of which is connected with the central portion of the second bar 29, while the other end thereof is connected with the outer end of a third bimetal bar 39, which partially overlaps the recess 18 in bimetal bar 15 and has its other end secured as by a plurality of rivets 41 to the underside of the bimetal bar 15 in substantially the position shown in Fig. 5 of the drawings. It is to be noted that the bimetal bar 39 is of relatively high thermal responsiveness, which is greater than that of bimetal bar 15. It may also be noted that the high expansion component in both bimetal bars 15 and 39 is on the upper surface of the two elements, so that when subjected to an increase of temperature, the bimetal bars will tend to move in a clockwise direction, as shown in Fig. 3 of the drawings, the bimetal bar 39 flexing a greater distance than does the bimetal bar 15.

Loosely mounted on bimetal bar 29 is a bridging member 43 made of electric-insulating material of substantially T-shape having its elongated stem 45 extending through an opening 30 in said bar 29, being retained by cotter pin 47. Secured in any suitable manner against the lower face of member 43 is a metal contact bridging member 49, and is adapted to engage a pair of spaced contact members 50 and 51, suitably secured against the upper surface of block 11 as by a plurality of short machine screws. I provide further a short spring bar 55, one end of which is secured against the lower surface of bimetal bar 29, while the other end extends to or slightly beyond the free end of bimetal bar 29 and be-

tween the bimetal bar and the upper surface of the contact bridging member 43. Spring 55 is initially bent so that it presses against contact bridging member 43, so as to increase the contact pressure between the contact bridging member 43 and the fixed contacts 50 and 51.

I provide a stop 57, of substantially L-shape, which has one end thereof secured as by a plurality of short machine screws 59 against the upper surface of block 11, so that, as shown in Fig. 4 of the drawings, the upper end of stem 45 of the contact bridging member 43 will engage a bar 61 secured to stop member 57 when the switch is open. I provide further means for varying the temperature at which disengagement of contact bridging member 43 from contacts 50 and 51 will occur, in the shape of a screw threaded bolt 63 fixed in member 11, having thereon a washer 65 which is adapted to be adjusted as to its position longitudinally of rod 63 by a nut 67. As is well known, the position of washer 65 on the screw-threaded stud 63 determines the temperature at which disengagement of the contact bridging member 43 will occur from the fixed contacts 49 and 51.

Fig. 2 of the drawings shows the positions of the various parts of the snap-acting thermal switch comprising particularly the bimetal bars 15, 29, and 39 in combination with the over center spring 37 when the switch is closed. Reference to Fig. 3 of the drawings shows the positions of the various elements of the toggle arm snap-acting switch when a certain temperature rise of the parts thereof has occurred, but this temperature rise is insufficient to cause snap-acting disengagement between the contact bridging member 49 and contacts 50 and 51. It will be noted, by reference to Fig. 3 of the drawings, that the bimetal bar 39, which, as has been hereinbefore stated, is of higher thermal sensitivity or responsivenes than is bimetal bar 15, has flexed a greater degree, in a clockwise direction, than has bimetal bar 15. The left hand end of over center spring 37 has therefore been moved beyond the position which it would occupy if the left hand end were connected directly to the bimetal bar 15. This position of the left hand end of spring 37 causes an increase in the pressure between the contact bridging member and the fixed contacts 50 and 51. This increased contact pressure is helped also by the spring bar 55.

This added movement of the left hand end of the over center spring 37 results also in a decrease in the temperature differential of operation of the switch, comprising the parts shown in the present application.

As is well known, in snap-acting switches of this general kind, the pressure between the contact bridging member and the fixed contacts tends to approach zero just before disengagement occurs therebetween, with the attendant result that if the change of temperature is very slow, there may be a tendency for the contacts to "fry," with resultant arcing and burning or charring of the contacts, whereby upon reengagement thereof a much greater resistance may be included in the circuit than had theretofore been the case.

The device embodying my invention thus provides a relatively simple means for increasing the pressure between the contacts of such a snap-acting termally-actuable switch, and for decreasing the temperature differential of operation of such switches.

Various modifications may be made in the device embodying my invention without departing from the spirit and scope thereof, and all such modifications coming clearly within the scope of the appended claims shall be considered as covered thereby.

I claim as my invention:

1. A thermostatic snap-acting switch comprising a first bimetal bar having one end thereof fixed and having a central longitudinal slot in its other end portion, a second bar positioned in pivotal end-to-end relation to said first bimetal bar and having a central longitudinal slot in its pivotally supported end portion, a second bimetal bar, of greater thermosensitivity than said first bimetal bar having one end thereof mounted on said first bar intermediate the ends thereof to partially overhang the slot in said first bimetal bar and an over center spring in said aligned slots having its ends connected to said second bar and said second bimetal bar.

2. A thermostatic snap-acting switch comprising a first bimetal bar having one end thereof fixed, a second bar pivotally operatively engaging said first bimetal bar to form a toggle joint therewith, a second bimetal bar, of greater thermosensitivity than said first bimetal bar, having one end secured to said first bimetal bar intermediate the ends thereof and having its other end free to flex more than said first bimetal bar upon change of temperature and an over center spring having its ends connected to the the other end of said second bimetal bar and to said second bar intermediate the ends thereof.

3. A thermostatic snap-acting switch comprising a pair of pivotally abutting toggle arms, at least one of said arms being of bimetal, a bimetal bar, of relatively high thermosensitivity secured at one of its ends to a longitudinally intermediate portion of one of said pair of arms and an over center spring having one end connected to the other end of said bimetal bar of high thermosensitivity and having its other end connected to the other of said arms.

4. A thermostatic snap-acting switch comprising a pair of pivotally abutting toggle arms, at least one of said arms being of bimetal and having its outer end fixed, a contact member on the outer end of the other arm, a cooperating fixed contact member, a bimetal bar, of greater thermosensitivity than said bimetal arm, having one end secured on said bimetal arm intermediate the ends thereof and being adapted to flex ahead of said bimetal arm upon change of temperature and an over center spring having one end thereof connected to the other end of said bimetal bar and having its other end connected to said other toggle arm intermediate the ends thereof and effective to increase the pressure of said contact member on a cooperating fixed contact member just prior to disengagement therebetween.

5. A thermostatic snap-acting switch comprising two bimetal bars positioned in pivotally abutting end-to-end relation, elongated, central, longitudinal slots in the adjacent ends of the two bars, a contact member on the outer end of one of said bars, a third bimetal bar of greater thermosensitivity than either of the other two bars having one end secured to one of said two bars to overhang the slot in that bar and an over center spring having its ends connected to said third bar and to the other bar, said third bar being adapted to flex more in the same direction than the bar to which it is secured to cause said contact member to engage a cooperating contact member with an appreciable pressure just

prior to snap-acting disengagement therefrom.

6. A thermostatic snap-acting switch comprising two bimetal bars positioned in pivotally abutting end-to-end relation, one end of one bar being fixed, elongated, central, longitudinal slots in the abutting ends of the two bars, a contact member loosely supported on the free end of the other of said bars, a fixed contact adapted to be engaged by and disengaged from said contact member, a third bimetal bar of greater thermosensitivity than that of the other two bars having one end secured to said one bar to overhang the slot in that bar, the high-expansion component of all of said bars being on the same side of the assembly, an over center spring having its end connected to said third bar and to the other bar and adapted to be positioned in said slots and a leaf spring having one of its ends secured to the other bar intermediate its ends and having its other end adapted to press the contact members into close operative engagement with each other when in engagement, said third bar being adapted to flex more in the same direction than the bar to which it is secured to cause said contact members to be engaged with an appreciable pressure just prior to snap-acting disengagement therebetween.

7. A thermostatic snap-acting switch comprising two bimetal bars positioned in pivotally abutting end-to-end relation, one end of one bar being fixed, elongated, central, longitudinal slots in the abutting ends of the two bars, a contact member loosely supported on the free end of the other of said bars, a fixed contact adapted to be engaged by and disengaged from said contact member, a third bimetal bar of greater thermosensitivity than that of the other two bars having one end secured to said one bar to overhang the slot in that bar, the high-expansion component of all of said bars being on the same side of the assembly, an overcenter spring having its end connected to said third bar and to the other bar and adapted to be positioned in said slots and a leaf spring having one of its ends secured to the other bar intermediate its ends and having its other end adapted to press the contact members into close operative engagement with each other when in engagement, said third bar being adapted to flex more in the same direction than the bar to which it is secured to cause said contact members to be engaged with an appreciable pressure just prior to snap-acting disengagement therebetween, and to reduce the temperature differential of operation of said switch.

CLARK M. OSTERHELD.